DOCUMENT RESUME

ED 363 285 IR 016 404

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TITLE Multimedia Science Education, Visual Literacy, and the Structure of Intellect.
PUB DATE 93
NOTE 7p.; In: Art, Science & Visual Literacy: Selected Readings from the Annual Conference of the International Visual Literacy Association (24th, Pittsburgh, PA, September 30-October 4, 1992); see IR 016 399.
PUB TYPE Reports - Descriptive (141) -- Reports - Evaluative/Feasibility (142) -- Speeches/Conference Papers (150)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS Case Studies; *Computer Assisted Instruction; Computer Software Development; High Schools; High School Students; Instructional Design; *Instructional Materials; *Multimedia Instruction; Programing; *Science Education; *Student Projects; Teaching Methods; United States History
IDENTIFIERS California; Graphical User Interfaces; *Interactive Computer Systems; *Multimedia Materials

ABSTRACT

A case study is presented of the use of educational multimedia. In the spring of 1992, a high school student produced an interactive multimedia project for the California State History Fair. This project, which dealt with Columbus, was developed on the Macintosh platform. Other software and hardware used are described. The artist (developer) began by familiarizing himself with the subject matter, and then designed the user interface and the script. Once basic programming and primary media sources were in place, illustration began. Finishing touches were added. A general review of the computer developments that made the design of multimedia presentations possible is given. (Contains 5 references.) (SLD)

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ED 363 285

Multimedia Science Education, Visual Literacy, and the Structure of Intellect

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by
Andrew J. Peterson

The development of multimedia technology has many implications for instructional design, performance assessment and the patterns of education in America. With interactive, visual archives, the teacher or student can demonstrate competence and become expert in a wide range of disciplines. Any one study, for example, history, can easily draw from other disciplines such as music, art and literature. Another computer-based revolution with many personal and cultural implications is on the horizon. The journey promises to be an interesting exploration of meaningful discovery.

The Project

This paper presents a case study of the use of educational multimedia. In the Spring of 1992 one of the authors, a high school student, produced an interactive multimedia project for the California State History Fair. A Columbus theme was perfect for the application of multimedia. The great explorer has been memorialized in picture and song for generations of Western Civilization (Grant, 1992).

For the first time, the state History Fair competition included a multimedia division. Although the use of multimedia in contemporary educational technology usually implies an interactive design, the competition was limited to a 10-minute slide show. This fact was discovered after much time was spent on an interactive design. In order to preserve the interactive component and meet the Fair's requirements a special button was put on the interface for the linear presentation. The Santa Fe Columbus project did win at the San Diego county level, but it was not selected as a top performer at the state level. With the foregoing as context for the project, the tools and design considerations will be described.

The Tools

Hardware

This Columbus project was developed on the Macintosh platform. A Quadra 700 was the computer employed. Including high-quality, color pictures with a decent amount of resolution requires a great amount of computing power

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(RAM) and storage. The program, which totalled almost 112 mb, was stored on a Pinnacle Micro REO-130 Optical Disk (128 mb).

The audio and visual material was prepared by a La Cie 24-bit scanner for the pictures and a Farallon MacRecorder for the music and narration. At the fair a Proxima Ovation color LCD panel was used for the presentation.

Software

In order to integrate all the sights and sounds sophisticated software was required. MacroMind Director 3.0 was the main application software used to build and support the program. Pictures were altered with Adobe Photoshop 2.0. and sound was edited with the Farallon Sound Edit.

The Development

Background of the Artist / Scholar

The 17-year-old artist/scholar had a good background in computers from an early age. As the personal computer revolution moved through the 80's, he stayed with the current hardware and software as it advanced in visual dimensions as well as speed. His first electronically published work was in Verbum Interactive at the age of 14. Additionally, an internship was obtained through the work on VI. During the summer between sophomore and junior years, he worked at GTE/Imagi-Trek, an R & D shop for a major phone company and the group that mastered VI. Over the summer of 1992 the young artist completed a stint at General Magic, another hi-tech shop. The statement of his goal was as follows:

> When I set out to create an interactive multimedia presentation, I set myself one goal: To prove to everyone that it doesn't take a large company with a budget of millions to create a multimedia presentation. A single Mac user can create his own interactive presentation, with a little creativity and hard work. When I started, my imagination was the limit. I created an environment in my head, where all of the knowledge around a single subject could be presented in a user-friendly way.

Step by Step

The product was completed according to the following phases:

1. Research
2. Design
3. Programming
4. Illustration
5. "Tweaking"

The development began with an immersion into the content of the topic. Library work, reading, discussing and reflecting provided the source material. Visual works were selected and scanned. It was this familiarity with the content which most shaped the later design choices. While experience with the computer interface was necessary, it was the structure of the content that motivated and honed the program.

Given the content and its form, the next step was to design the user interface and the script. The modes and context for the navigation were devised. A glance at the content, flashes of insight, more research, plus trial and error characterized the journey. General gestalten were sought and grammatical details were fine-tuned. The composer remarks:

> When it comes to multimedia, I think the best process for learning new things is by experimentation. I tested out a lot of new ideas when I created my Columbus presentation. QuickTime was a relatively new program then, but I practiced and tested it out in the course of my work. You always need to try to see if things work. I started with a plan, and then got rid of all the ideas that just didn't work.

Programming in multimedia involves pictures and music as well as text. Links between graphics, pictures, human voice and sounds were made behind the scenes, yet accessible to the user. The author worked long and hard to get his narration and its access by the user just right:

> If you create an environment where the user controls all of the knowledge by letting them do their own navigating, then you've succeeded in creating an interactive presentation.

Once basic programming was written and primary media sources were in place, a good deal of illustration was required to complete a user interface "keeping what really looked good and what was easy to use". For instance, the Columbus Timeline was drawn so the user could enjoy viewing and selecting from a series of relevant dates. Further illustration was done with music. It was interesting to experience the drama from the addition of *Carmina Burana* to the opening paintings. The producer comments in this regard:

> I think it can be really exciting to bring together movies and sounds, along with pictures and words. The separate sections of a multimedia presentation when brought together can create a really exciting presentation.

Last came the "finishing touches". Again, more trial-and-error and double checking. Occasionally a new primary source would be found for incorporation. The final product will always be WIP ("work in progress"). According to our young composer the journey was well worthwhile:

> What I learned most about multimedia, is perhaps the amount of work that goes into it. Always paying attention to all of the tiny details is the major work of doing an interface. But in the end, I think nothing is greater than seeing faces light up with excitement, especially when the gift you are giving them is knowledge.

Graphical User Interface (GUI)

The Macintosh Way

In the late 70's, the microprocessor made the personal computer a technical possibility. But at the time there was great concern that the digital computer would decrease rather than increase personal freedom. The Orwellian vision was a common dread. However, the technical possibility was made real by breaking the operating system codes with a visual metaphor. At Apple Computer Company the novel idea was proposed that one should work with a computer in the same way other daily office tasks are accomplished. Thus, the Lisa R & D program at Apple engineered a user interface based on the visual images of the desktop metaphor. The icons composed the first commercially available Graphic User Interface (GUI). The huge success of *Windows* finally proves Apple's point--even to the PC world.

Computers and Big Brother

In *Microcosm: The Quantum Revolution in Economics and Technology* (1989) George Gilder has rightly pointed out that the Information Revolution has brought a qualitative difference to our economy and way of life. While the issues of faith and family have not changed, the material aspects of our life must be seen in a new light since the advent of the digital computer. The Industrial Age had its own distinctive characteristics from previous eras. Although vision and insight were crucial for those enterprises, so much of the daily means to accomplishing projects required raw materials and the brute strength of men and women. All capital was material, it could be touched and seen. But the Information age is different:

> Today, the ascendant nations and corporations are masters not of land and material resources but of ideas and technologies. Japan and other barren Asian islands have become the world's fastest-growing economies. Electronics is the world's fastest-growing major industry. Computer software, a pure product of mind, is the chief source of added value in world commerce. The global network of telecommunications carries more valuable goods than all the world's supertankers. Today, wealth comes not to the rulers of slave labor but to the liberators of human creativity, not to the conquerors of land but to the emancipators of mind. (Gilder, p. 18)

In the 50's computers such as ENIAC at the University of Pennsylvania filled very large rooms with their bulk of vacuum tubes and heavy electrical wiring. International Business Machines applied its expertise in building and marketing reliable, if unimaginative, office equipment to the corporate and government bureaucracies. Computerization meant standardization and control. Extrapolating these attributes to the political order was worrisome indeed. Many predicted that centralized, collectivist govern-

ments would spring up with this new technology as an efficient, heartless means to subjugate the masses. Indeed, Left-oriented politicians have tried to extend the reach of the state into private life through computerization and the increasingly detailed questionnaires of the Internal Revenue Service, Social Security, and the Census Bureau.

Then came the personal computer revolution. Once the engineers made the machine affordable, the computer became personal in the sense of unique expression of one's interests and abilities as well as an appliance that could be used at home. At first, the IBM computer community actually ridiculed the very idea of computers for the individual which were user-friendly. People in large businesses had little reason to want a computer at home. Yet this was the vision of a group of young people in the Bay Area called Apple Computer.

However, would not this be the last place to expect interest in computers? The mix of Xerox, Stanford and Berkeley was a heady brew. Apple set out to make a computer "for the rest of us"--those who were neither engineer nor bureaucrat. Even Hubert Dreyfus (1972), University of California's philosophical critic of the computer mind-set, had always advocated using artificial intelligence if it was done with the right perspective and for the right reasons.

As Apple Computer and others built personal computers, the idea caught on fast. Apple marketed their machine as a "mental bicycle" allowing individual users to go places they had never visited. The Apple interface was made increasingly more "user-friendly", culminating with the Lisa/Macintosh system. It was a self-conscious choice to emulate the way the average person works. This route was taken in the face of great opposition. The goal was to allow the occasional user to be able to calculate, list and print without a long series of arcane commands that were typical of the IBM-style of computer.

Being a new technology, unhampered by government regulation and meeting an apparent need, the approach thrived in the free market. "Power to the people" became a reality rather than a cynical slogan to manipulate Chinese and American intellectuals. Computers were now used by pastors to record their sermons, small businesses to keep their inventories, grass-roots political groups to raise money with special mailing lists, etc. This was a new medium *not* controlled by network television, the United States Post Office or the Ivy League universities. Today millions of Americans own computers that can provide calculations, databases, spreadsheets, word processing, and desktop publishing. Only a short time ago these functions were business tools available only to a wealthy few. In fact, the lead in technology and sheer number of personal computers and fax machines was a great problem for world communism. Thus, the social impact of the computer turned out to be productive rather than oppressive.

The MultiMedia Way

Once again a technological breakthrough has made personalization of high-level work possible for the individual. Add visual and auditory data to print and the result is a revolution with all the basic myths and opportunities (Hawkins, 1992). Multimedia is now possible on the desktop. A Columbus production can be done with a million dollar budget or no budget.

As in 1978 another digital revolution is occurring for the individual—personal multimedia production. The interface must again be intuitive with lots of visual cues. But even more so with visual material as part of the content, those who do not know "the code" are invited to participate. Both interface and content contain visual cues for understanding. To use a theological analogy, the transition from general revelation of visual images to specific verbal information is quick and obvious, given the right content and the right design. Eventually users can learn the code, as they need it, and more. This new Columbian journey is just in the planning stage of a great exploration in knowledge and communication.

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